IN THE CLAIMS

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1-63. (Cancelled).

64. (New) A method for forming a macroscopic assembly of substantially aligned single-wall carbon nanotubes, comprising:
    (a) suspending a plurality of single-wall carbon nanotubes in a suspending medium to form a suspension;
    (b) subjecting the single-wall carbon nanotubes to an aligning field, whereby the single-wall carbon nanotubes align with the field;
    (c) aggregating the aligned single-wall carbon nanotubes while said single-wall carbon nanotubes are subject to the aligning field; and
    (d) separating the single-wall carbon nanotubes from the suspending medium.

65. (New) The method of claim 64 wherein the suspending medium is oleum.

66. (New) The method of claim 64 wherein the suspending medium is selected from the group consisting of dimethylformamide, surfactant and water, sol-gel, and molten metal.

67. (New) The method of claim 64 wherein the suspending medium is water and the single-wall carbon nanotubes are bound to chemical compositions which result in the suspension of the single-wall carbon nanotubes in said water.

68. (New) The method of claim 67 wherein the chemical compositions are selected from the group consisting of polymers and peptides.

69. (New) The method of claim 68 wherein the polymer is polystyrene.

70. (New) The method of claim 64 wherein the aligning field is selected from the group consisting of a magnetic field, an electric field, a shear flow field, and combinations thereof.

71. (New) The method of claim 64 wherein the aligning field comprises a magnetic field.

72. (New) The method of claim 64 wherein said single-wall carbon nanotubes are selected from the group consisting of derivatized single-wall carbon nanotubes, underivatized single-wall carbon nanotubes, and combinations thereof.

73. (New) The method of claim 64 wherein the single-wall carbon nanotubes are aggregated by a method selected from the group consisting of (a) filtering the suspension whereby the substantially aligned single-wall carbon nanotubes remain on the filter, (b) adding salt to the suspension, (c) applying an electric field to the suspension; (d) allowing the single-wall carbon nanotubes to settle from the suspension; (e) evaporating the suspending medium; and (f) combinations thereof.

74. (New) The method of claim 73 wherein the salt is magnesium chloride.

75. (New) The method of claim 64 wherein the macroscopic assembly is in a form selected from the group consisting of ropes, fibers, cables, membranes, arrays, buckypapers, and buckyribbons.

76. (New) The method of claim 75 wherein said membranes are at least about 1 micron thick.

77. (New) The method of claim 75 wherein said membranes are about 10 microns thick.

78. (New) The method of claim 75 wherein said membranes are at least about 10 microns thick.

79. (New) The method of claim 75 wherein the single-wall carbon nanotubes in said membrane are parallel to the plane of the membrane.

80. (New) The method of claim 75 wherein the single-wall carbon nanotubes in said membrane are perpendicular to the plane of the membrane.

81. (New) A method for forming a macroscopic assembly of substantially aligned single-wall carbon nanotubes, comprising:

(a) suspending a plurality of single-wall carbon nanotubes in a suspending medium to form a suspension;

(b) subjecting the single-wall carbon nanotubes to a magnetic field, whereby the single-wall carbon nanotubes become aligned with the magnetic field;

(c) aggregating the single-wall carbon nanotubes; and

(d) separating the single-wall carbon nanotubes from the suspending medium.

82. (New) The method of claim 81 wherein said magnetic field is selected from the group consisting of an alternating current magnetic field and a direct current magnetic field.

83. (New) The method of claim 81 wherein said magnetic field is generated by a source selected from the group consisting of a permanent magnet, an electromagnet, a superconducting electromagnet, and an electrical current flowing in a conductive structure.

84. (New) The method of claim 81 wherein the magnetic field has a strength of at least about 0.5 Tesla.

85. (New) The method of claim 81 wherein said single-wall carbon nanotubes are selected from the group consisting of derivatized single-wall carbon nanotubes, underivatized single-wall carbon nanotubes, and combinations thereof.

86. (New) The method of claim 81 wherein the suspending medium is selected from the group consisting of oleum, dimethylformamide, surfactant and water, and sol-gel.

87. (New) The method of claim 81 wherein the suspending medium is water and the single-wall carbon nanotubes are bound to chemical compositions which result in the suspension of the single-wall carbon nanotubes in said water.

88. (New) The method of claim 87 wherein the chemical compositions are selected from the group consisting of polymers and peptides.

89. (New) The method of claim 88 wherein the polymer is polystyrene.

90. (New) The method of claim 81 wherein the single-wall carbon nanotubes are caused to come out of suspension by a method selected from the group consisting of (a) filtering the suspension whereby the substantially aligned single-wall carbon nanotubes remain on the filter, (b) adding salt to the suspension, (c) applying an electric field to the suspension; (d) allowing the single-wall carbon nanotubes to settle from the suspension; (e) evaporating the suspending medium; and (f) combinations thereof.

91. (New) The method of claim 81 wherein said step of aggregating the single-wall carbon nanotubes occurs while the single-wall carbon nanotubes are subject to the magnetic field.

92. (New) The method of claim 90 wherein the salt is magnesium chloride.

93. (New) The method of claim 81 wherein the macroscopic assembly is in a form selected from the group consisting ropes, fibers, cables, membranes, arrays, buckypapers, and buckyribbons.

94. (New) The method of claim 93 wherein said membranes are at least about 1 micron thick.

95. (New) The method of claim 93 wherein said membranes are about 10 microns thick.

96. (New) The method of claim 93 wherein said membranes are at least about 10 microns thick.

97. (New) The method of claim 93 wherein the single-wall carbon nanotubes in said membrane are parallel to the plane of the membrane.

98. (New) The method of claim 93 wherein the single-wall carbon nanotubes in said membrane are perpendicular to the plane of the membrane.

99. (New) A method for forming a macroscopic ordered assembly of single-wall carbon nanotubes, comprising:

(a) suspending a plurality of single-wall carbon nanotubes in a suspending medium to form a suspension;

(b) subjecting the single-wall carbon nanotubes to a shear flow field by extrusion, whereby the single-wall carbon nanotubes become aligned; and

(c) removing the suspending medium from the single-wall carbon nanotubes.

100. (New) The method of claim 99 wherein the macroscopic ordered assembly is in a form selected from the group consisting ropes, fibers, cables, membranes, arrays, buckypapers, and buckyribbons.

101. (New) The method of claim 100 wherein the ropes are about 0.1 μm in diameter.

102. (New) The method of claim 100 wherein the ropes are at least about 0.1 μm in diameter.

103. (New) The method of claim 100 wherein the membrane comprises single-wall carbon nanotubes substantially parallel to the plane of the membrane.

104. (New) The method of claim 99 wherein the suspending medium is oleum.

105. (New) The method of claim 99 wherein the suspending medium is removed by water.

106. (New) The method of claim 99 wherein said single-wall carbon nanotubes are selected from the group consisting of derivatized single-wall carbon nanotubes, underivatized single-wall carbon nanotubes, and combinations thereof.

107. (New) The method of claim 99 further comprising joining macroscopic ordered assemblies of single-wall carbon nanotubes to make larger assemblies.

108. (New) The method of claim 107 wherein the segments of single-wall carbon nanotubes in the macroscopic ordered assemblies are joined either at their ends, their sides or both.

109. (New) The method of claim 107 wherein the joining method is selected from the group consisting of chemical cross-linking, heating, energetic particle radiation, electron beam bombardment, and combinations thereof.

110. (New) The method of claim 109 wherein said chemical cross-linking is achieved by intercalating a chemical agent into the macroscopic ordered assemblies.

111. (New) The method of claim 110 wherein said chemical agent is an acid.

112. (New) The method of claim 110 wherein said chemical agent is sulfuric acid.

113. (New) The method of claim 109 wherein the temperature of said heating is between about 300°C and about 1500°C.

114. (New) The method of claim 109 wherein the temperature of said heating is between about 900°C and about 1300°C.

115. (New) The method of claim 109 wherein said heating occurs in the presence of hydrogen.

116. (New) The method of claim 99 wherein said extrusion occurs in the presence of an aligning field.

117. (New) A method for assembling single-wall carbon nanotubes on a substrate comprising:

(a) providing a plurality of single-wall carbon nanotubes selected from the group consisting of a solution of the single-wall carbon nanotubes and a suspension of the single-wall carbon nanotubes;

(b) subjecting the single-wall carbon nanotubes to an aligning field, whereby the single-wall carbon nanotubes align with the field;

(c) contacting said aligned single-wall carbon nanotubes with a substrate; and

(d) forming a three-dimensional structure of substantially aligned single-wall carbon nanotubes on the substrate.

118. (New) The method of claim 117 wherein the single-wall carbon nanotubes are selected from the group consisting of derivatized single-wall carbon nanotubes, underivatized single-wall carbon nanotubes, and combinations thereof.

119. (New) The method of claim 118 wherein said derivatized single-wall carbon nanotubes are selected from the group consisting of end-derivatized single-wall carbon nanotubes, side-derivatized single-wall carbon nanotubes, and combinations thereof.

120. (New) The method of claim 117 wherein the suspending medium is selected from the group consisting of oleum, dimethylformamide, surfactant and water, sol-gel, and molten metal.

121. (New) The method of claim 117 wherein the aligning field is selected from the group consisting of a magnetic field, an electric field, and combinations thereof.

122. (New) The method of claim 117 wherein the substrate comprises a component selected from the group consisting of a fiber, a metal, an ordered assembly of single-wall carbon nanotubes, and highly oriented pyrolytic graphite.

123. (New) The method of claim 122 wherein the metal substrate is gold.

124. (New) The method of claim 122 wherein the fiber substrate is selected from the group consisting of carbon fiber and metal wire.

125. (New) The method of claim 117 wherein the single-wall carbon nanotubes are contacted with the substrate by a method selected from the group consisting of chemical bonding, non-covalent bonding, physical contacting, and combinations thereof.

126. (New) The method of claim 117 wherein the single-wall carbon nanotubes are contacted with the substrate by a method selected from the group consisting of moving the substrate through the suspending medium, condensing said plurality of single-wall carbon nanotubes on the substrate, and combinations thereof.

127. (New) The method of claim 117 wherein the single-wall carbon nanotubes migrate to the substrate.

128. (New) The method of claim 117 wherein an electric field is applied to the plurality of single-wall carbon nanotubes.

129. (New) The method of claim 117 wherein the single-wall carbon nanotubes are substantially perpendicular to the substrate.

130. (New) The method of claim 117 wherein the single-wall carbon nanotubes are substantially parallel to the substrate.

131. (New) The method of claim 117 wherein the three-dimensional structure of substantially aligned single-wall carbon nanotubes on a substrate is in a form selected from the group consisting ropes, fibers, cables, membranes, arrays, buckypapers, and buckyribbons.

132. (New) A method for forming a composite of substantially aligned single-wall carbon nanotubes and a solid matrix material:

(a) providing a suspension of single-wall carbon nanotubes in a liquid;

(b) subjecting the single-wall carbon nanotubes to an aligning field, whereby the single-wall carbon nanotubes align with the field; and

(c) converting the liquid to a solid matrix material thereby forming a composite of substantially aligned single-wall carbon nanotubes and solid matrix material.

133. (New) The method of claim 132 wherein the liquid is selected from the group consisting of polymer, sol-gel and molten metal.

134. (New) The method of claim 133 where said metal is aluminum.

135. (New) The method of claim 132 wherein the aligning field is selected from the group consisting of a magnetic field, an electric field, a shear flow field, and combinations thereof.

136. (New) The method of claim 132 wherein said single-wall carbon nanotubes are selected from the group consisting of derivatized single-wall carbon nanotubes, underivatized single-wall carbon nanotubes, and combinations thereof.

137. (New) The method of claim 132 wherein the liquid is converted to a solid matrix material by cooling.

138. (New) The method of claim 132 further comprising removing the solid matrix material from the composite.

139. (New) The method of claim 138 wherein the method of removal of the solid matrix material is selected from the group consisting of heating, acid etching and combinations thereof.

140. (New) The method of claim 132 wherein the conversion of the liquid to a solid matrix material is in the presence of the aligning field.

141. (New) A method of forming a macroscopic three-dimensional structure from field-aligned single-wall carbon nanotubes comprising:
   (a) suspending a plurality of single-wall carbon nanotubes in a suspending medium to form a suspension;
   (b) subjecting the single-wall carbon nanotubes to a field that is selected from the group consisting of electric fields, magnetic fields, and shear flow fields, whereby the single-wall carbon nanotubes become aligned substantially parallel with the field; and
   (c) modifying the suspension to cause the substantially parallel single-wall carbon nanotubes to aggregate while being subject to the aligning field.

142. (New) The method of claim 141 wherein the three dimensional structure of field aligned single-wall carbon nanotubes is in a form selected from the group consisting of ropes, fibers, cables, membranes, arrays, buckypapers, and buckyribbons.

143. (New) The method of claim 141 wherein the membrane comprises single-wall carbon nanotubes substantially parallel to the plane of the membrane.

144. (New) The method of claim 141 wherein the membrane comprises single-wall carbon nanotubes substantially perpendicular to the plane of the membrane.

145. (New) The method of claim 141 further comprising removing the suspending medium from the three-dimensional structure of field-aligned single-wall carbon nanotubes.

146. (New) The method of claim 141 wherein the single-wall carbon nanotubes are selected from the group consisting of derivatized single-wall carbon nanotubes, underivatized single-wall carbon nanotubes, and combinations thereof.

147. (New) The method of claim 141 wherein modification of the suspension is done by a method selected from the group consisting of (a) filtering the suspension whereby the substantially aligned single-wall carbon nanotubes remain on the filter, (b) adding salt to the suspension, (c) applying an electric field to the suspension; (d) allowing the single-wall carbon nanotubes to settle from the suspension; (e) evaporating the suspending medium; and (f) combinations thereof.

148. (New) A method of separating different types of single-wall carbon nanotubes comprising the steps of:
   (a) suspending the plurality of single-wall carbon nanotubes in a suspending medium to form a suspension; and
   (b) subjecting the single-wall carbon nanotubes to a magnetic field sufficient to cause the single-wall carbon nanotubes to migrate in different directions due to gradients in the magnetic field whereby the different types of single-wall carbon nanotubes are separated.

149. (New) The method of claim 148 wherein the suspending medium is selected from the group consisting of oleum, dimethylformamide, surfactant and water, sol-gel, and molten metal.

150. (New) The method of claim 148 wherein the different types of single-wall carbon nanotubes are selected from the group consisting of paramagnetic single-wall carbon nanotubes and diamagnetic single-wall carbon nanotubes.

151. (New) The method of claim 148 further comprising the step of removing the single-wall nanotubes from the suspension according to type.

152. (New) A method for forming a nanotube membrane of substantially aligned single-wall nanotubes, comprising:
   (a) suspending single-wall carbon nanotubes segments in a surfactant solution;
   (b) pumping said solution through a filter assembly;
   (c) applying a magnetic field near said filter assembly;
   (d) flushing said filter assembly;

(e) drying said filter assembly; and

(f) separating a membrane of substantially aligned single-wall carbon nanotubes from a surface of said filter assembly.

153. (New) The method of claim 152 wherein said magnetic field is generated by a magnetic field source selected from the group consisting of permanent magnets, electromagnets, superconducting electromagnets, and electrical currents flowing in a conductive structure.

154. (New) The method of claim 152 wherein said magnetic field is generated by a magnetic field source selected from the group consisting of permanent magnets and electromagnets.

155. (New) The membrane of claim 152 wherein said membrane is at least about 1 microns thick.

156. (New) The method of claim 152 wherein said membrane is about 10 microns thick.

157. (New) The method of claim 152 wherein said membrane is at least about 10 microns thick.

158. (New) The method of claim 152 wherein said membrane is macroscopic.

159. (New) A method for forming a macroscopic membrane of substantially aligned single-wall nanotubes, comprising:

(a) suspending single-wall carbon nanotubes segments in a suspending agent to form a suspension;

(b) flowing said suspension through a magnetic field whereby the single-wall carbon nanotubes align with the field;

(c) flowing the suspension through a filter whereby the single-wall carbon nanotubes remain on the filter; and

(d) separating a membrane of substantially aligned single-wall carbon nanotubes from a surface of said filter.

160. (New) The method of claim 159 further comprising the following steps prior to separating the membrane from the filter:

(a) flushing the single-wall carbon nanotubes on said filter; and

(b) drying the single-wall carbon nanotubes on said filter.

161. (New) The method of claim 159 wherein said magnetic field is generated by a magnet selected from the group consisting of a permanent magnet, an electromagnet, a superconducting electromagnet or an electrical current flowing in a conductive structure.

162. (New) The method of claim 159 wherein said magnetic field is generated by a magnet selected from the group consisting of a permanent magnet and an electromagnet.

163. (New) The method of claim 159 wherein the thickness of said membrane is between about 1 and about 10 microns.

164. (New) An apparatus for forming arrays of substantially aligned single-wall carbon nanotubes, comprising:

(a) a source of suspended single-wall carbon nanotubes;

(b) an area for receiving said suspended single-wall carbon nanotubes;

(c) a source of a magnetic field for application to said area; and

(d) a filter for receiving said single-wall carbon nanotubes.

165. (New) The apparatus of claim 164 wherein said source of a magnetic field is selected from the group consisting of permanent magnets, electromagnets, superconducting electromagnets, and electrical currents flowing in a conductive structure.

166. (New) The apparatus of claim 164 wherein said source of a magnetic field is selected from a group consisting of permanent magnets, electromagnets, and superconducting electromagnets.

167. (New) The apparatus of claim 164 wherein said magnetic field has a strength of at least about 0.5 Tesla.

168. (New) The apparatus of claim 164 wherein said single-wall carbon nanotubes are suspended in dimethylformamide.

169. (New) The apparatus of claim 164 wherein said suspended single-wall carbon nanotubes are forced through said area by high-pressure gas.

170. (New) The apparatus of claim 164 wherein said suspended single-wall carbon nanotubes are pulled through said area by a vacuum.

171. (New) An apparatus for forming arrays of substantially aligned single-wall carbon nanotubes, comprising:
  (a) a tank;
  (b) a positive electrode disposed in said tank;
  (c) a negative electrode disposed in said tank;
  (d) a filter disposed in said tank near said positive electrode;
  (e) a plurality of single-wall carbon nanotubes suspended in a suspending agent in said tank such that said filter is between said single-wall carbon nanotubes and said positive electrode; and
  (f) a source of a magnetic field for aligning said single-wall carbon nanotubes; and wherein said single-wall carbon nanotubes migrate toward said positive electrode in response to the application of a voltage differential and are caught on said filter.

172. (New) An apparatus for forming macroscopic arrays of substantially aligned single-wall carbon nanotubes, comprising:
  (a) a reservoir of suspended single-wall carbon nanotubes;
  (b) a chamber connected to said reservoir for receiving said single-wall carbon nanotubes and subjected to a magnetic field in which the suspended single-wall carbon nanotubes align with said magnetic field; and
  (c) a filter in said chamber for receiving said single-wall carbon nanotubes.

173. (New) The apparatus of claim 172 wherein said magnetic field is generated by a magnet selected from a group consisting of a permanent magnet, an electromagnet, a superconducting electromagnet or an electrical current flowing in a conductive structure.

174. (New) The apparatus of claim 172 wherein said magnetic field is generated by a magnet selected from a group consisting of a permanent magnet, an electromagnet, and a superconducting electromagnet.

175. (New) The apparatus of claim 172 wherein said magnetic field has a strength of at least about 0.5 Tesla.

176. (New) The apparatus of claim 172 wherein said single-wall carbon nanotubes are suspended in dimethylformamide.

177. (New) The apparatus of claim 172 wherein said suspended single-wall carbon nanotubes are forced through said chamber by high-pressure gas.

178. (New) The apparatus of claim 172 wherein said suspended single-wall carbon nanotubes are pulled through said chamber by a vacuum.